

DESCRIPTIONS OF SOME NEW ARANEIDÆ OF NEW  
SOUTH WALES. No. 8.

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(ENTOMOLOGIST TO THE AUSTRALIAN MUSEUM.)

(Plates XVII.-XVIII.)

Family EPEIRIDÆ.

Genus EPEIRA, Walck.

EPEIRA PALLIDA, sp. nov.

(Plate XVII., fig. 1.)

♀. Cephalothorax 4 mm. long,  $3\frac{1}{2}$  mm. broad; abdomen 9 mm. long, 6 mm. broad.

*Cephalothorax* yellowish-brown, hairy. *Caput* high, arched, truncated in front, sides and base clothed with long coarse hoary hairs, apex sparingly furnished with short hoary pubescence. *Clypeus* broad, strongly arched, thickly clothed with long coarse hoary hairs; lateral radial grooves indistinct, median groove or cleft deep, short, strongly curved, the curvature directed backwards. *Marginal band* narrow.

*Eyes* glossy black; the four comprising the median group are seated on a tubercular eminence, forming a trapezium; those of the front row separated from each other by about twice their individual diameter, and those of the second row by a space equal to rather more than one diameter; the two rows separated from each other by about two and a half diameters; side eyes minute, seated obliquely on small tubercles, not contiguous.

*Legs* yellowish-grey, with somewhat darker annulations, moderately long, strong, clothed with short hoary hairs, and armed with short, strong, black spines; relative lengths 1, 2, 4, 3.

*Palpi* short, similar in colour and armature to legs, tips black.

*Falces* glossy, yellowish, inner margins fringed with short black hairs.

*Maxillæ* short, yellowish, inclining inwards, arched; sides clothed with short hoary hairs at their base.

*Labium* concolorous, short, broader than long.

*Sternum* shield-shaped, dark brown, thickly clothed with hoary hairs.

*Abdomen* ovate, pale yellow, boldly projecting over base of cephalothorax, two small tubercles seated laterally near anterior extremity; superior surface ornamented with a network of tracery, barely visible to the naked eye; in addition to this there are six small punctures arranged in pairs; sides olive-green, inferior surface yellowish-grey.

*Epiqyne* a simple slightly curved transverse slit, at the centre of which on the upper lip there is a small, blunt, dark brown protuberance.

*Hab.*—Guildford.

#### EPEIRA CRASSIPES, sp. nov.

(Plate XVII., figs. 2, 2a.)

♀. Cephalothorax  $5\frac{1}{2}$  mm. long, 5 mm. broad; abdomen 8 mm. long, 5 mm. broad.

*Cephalothorax* yellowish-green, convex, hairy. *Caput* high, strongly arched, truncated in front, clothed with long coarse hoary hairs. *Clypeus* convex, broad, indented at the centre, clothed with long coarse hoary hairs. *Marginal band* broad, fringed with long coarse hoary hairs.

*Eyes* black; those of the central group equal in size, mounted on a dark brown tubercle, and forming a trapezium; the pair comprising the front row separated from each other by a space equal to twice their individual diameter, those of the second row by about one diameter, and the two rows from each other by about two diameters; lateral eyes minute, seated obliquely on small yellowish tubercles, but not contiguous.

*Legs* rather short, strong, with yellowish and dark brown annulations, thickly clothed with long hoary hairs, and armed with long black spines; relative lengths 1, 2, 4, 3.

*Palpi* short, strong, similar in colour and armature to legs.

*Falces* long, strong, glabrous, divergent at apex; the upper margin of the furrow of each falx armed with a row of four teeth, and the lower with a row of three; fangs dark brown at base, wine-red at points.

*Maxillæ* strong, broad, arched, glossy; laterally, towards base, obscurely coloured; apices and inner margins yellowish.

*Labium* conical, broader than high, obscurely coloured at base, yellowish at apex.

*Sternum* cordate, convex, glossy, dark brown with a median longitudinal bar of yellow, becoming very slightly broader from near the centre, and continuing gradually so to posterior extremity; the surface moderately clothed with shortish hoary hairs.

*Abdomen* ovate, convex, boldly projecting over base of cephalothorax, slightly indented at posterior extremity, the superior surface and sides clothed with short yellowish pubescence; seated laterally, towards anterior extremity, there are two small tubercle-like eminences; colours yellow, with two lateral anterior patches of darkish yellow-grey; the superior surface ornamented with a delicate tracery of wavy lines, commencing well forward and terminating at posterior extremity; in addition to these there is a series of ten punctures which, with the exception of the anterior pair, are distributed in transverse rows of two each, and of these the central pair are the largest and most prominent; the punctures dark brown within; sides yellow above, dark brown markings below; inferior surface yellowish-grey between epigyne and spinnerets; the latter are dark brown with an irregular patch of sooty black.

*Epigyne* a dark brown, arched, moderately high protuberance, having the appearance of a thick overhanging lip when viewed from above.

*Hab.*—Guildford.

*Obs.*—This species is somewhat variable, both in regard to size, colouration, ornamentation, and convexity. Some individuals are slightly darker than others, while the ornamental tracery is also much more prominent.

EPEIRA VARIABILIS, sp. nov.

(Plate xvii., figs. 3, 3a, 3b.)

♀. Cephalothorax 5 mm. long, 4 mm. broad; abdomen 10 mm. long, 6 mm. broad.

*Cephalothorax* yellowish, hairy, convex. *Caput* arched, truncated in front, glossy, clothed with long hoary hairs. *Clypeus* yellowish, with curved lateral dark brown bands, convex, clothed with long hoary hairs; median depression deep, lateral radial grooves indistinct. *Marginal band* broad, fringed with short hoary hairs.

*Eyes* black; central group form a trapezium, and are elevated on a moderately high tubercle; of these the front pair are slightly the smallest; lateral eyes minute, placed obliquely on small tubercles and contiguous.

*Legs* long, strong, reddish-brown with dark brown annulations, clothed with dark brown hairs, and armed with moderately long black spines.

*Palpi* short, yellow, similar in clothing and armature to legs.

*Falces* glossy, concolorous, divergent at apex; each margin of the furrow of each falx armed with a row of three teeth.

*Maxilla* glossy, dark brown, pale yellowish laterally.

*Labium* short, broad, arched, dark brown.

*Sternum* concolorous, glossy, shield-shaped, convex, uneven, moderately clothed with short hoary pubescence.

*Abdomen* oblong-ovate, convex, strongly projecting over base of cephalothorax; superior surface cream-coloured, and ornamented with median and lateral dark and reddish-brown markings and a few minute red spots; sides—upper portion dark brown, mottled with red and cream-coloured patches and spots, lower portion yellowish-grey; inferior surface yellowish-grey with a long broad longitudinal patch of dark brown, the margins of which are



waved; in addition to this, the patch is bordered in front and laterally with a narrow waved band of yellow, and there are also six faintly discernible yellow spots in the median line seated in pairs, commencing in front and terminating towards the centre, and two minute lateral ones near the spinnerets; of this series the first pair are sensibly the largest.

*Epigyne* a dark brown lobe, with a long flagellate process commencing in front at its base, and directed backwards.

*Hab.*—New England and Bungendore.

*Obs.*—This species is widely distributed. Mr. A. M. Lea collected it both in the New England district and at Bungendore. I have also received a number of specimens from Gisborne, Victoria, where it was collected by Mr. George Lyall, Junr. Comparing the specimens collected by Mr. Lea, and again those collected by Mr. Lyall, the species appears to be exceedingly variable both in intensity of colouration and size. Those from Gisborne are somewhat larger than the New South Wales varieties, and much more brightly coloured. In so far as the specimens obtained in this colony are concerned, there is also considerable variation in colour and size.

EPEIRA SYLVICOLA, sp. nov.

(Plate xvii., figs. 4, 4a.)

♀. Cephalothorax 4 mm. long, 3 mm. broad; abdomen 7 mm. long, 5 mm. broad.

*Cephalothorax* reddish-brown, glossy, convex. *Caput* high, strongly arched, truncated in front, furnished with a few exceedingly short and fine white hairs at the base, sides and ocular area, the summit glabrous. *Clypeus* broad, convex, lateral indentations somewhat indistinct; a deep indentation seated at the middle; colour reddish-brown, becoming somewhat lighter at posterior extremity. *Marginal band* broad, yellowish-brown.

*Eyes* glossy black; the four comprising the central group seated upon a moderately high dark brown tubercular eminence, forming a trapezium; of these the two front eyes are somewhat the largest, and are separated from each other by a space equal

to fully twice their individual diameter, and those of the second row by about one-and-a-half diameters; the two rows separated from each by about two diameters; side eyes minute, contiguous, and seated obliquely on small dark brown tubercles.

*Legs* moderately long and strong, reddish-brown, lightly clothed with short, fine, black hairs, and armed with a few short black spines; *tarsi* black; relative lengths 1, 2, 4, 3.

*Palpi* short, similar in colour and armature to legs.

*Falces* reddish-brown at base, becoming darker towards extremities, glossy, divergent; inner margins fringed with a few short, fine, white hairs; the margins of the furrow of each falx armed with a row of four teeth.

*Maxillæ* short, strongly arched, widely divergent, the apices inclining inwards.

*Labium* short, broad, arched, reddish-brown at base, pale yellow at apex.

*Sternum* shield-shaped, convex, dark brown, sparingly clothed with short white hairs.

*Abdomen* oval, arched, strongly projecting over base of cephalothorax; colours—at anterior extremity there is a black transverse patch, strongly cleft at the centre; thence light grey towards the middle, from whence it becomes suddenly dark grey; sides light grey; inferior surface obscurely coloured.

*Epigyne* a reddish-brown eminence curved posteriorly, indented in front, and lobed laterally.

*Hab.*—Guildford.

*Obs.*—This species is rather common in the County of Cumberland. I have taken it in the Illawarra district, and at Guildford, Fairfield and Liverpool.

#### Subfamily ARGIOPINÆ.

Genus ARGIOPE, Sav. et Aud.

ARGIOPE EXTENSA, sp. nov.

(Plate XVII., figs. 5, 5a, 5b, 5c.)

♀. Cephalothorax 3 mm. long, 2 mm. broad; abdomen 8 mm. long, 4 mm. broad.

*Cephalothorax* yellowish with dark brown lateral markings. *Caput* elevated, arched, truncated in front, normal grooves distinct; colour yellowish with fine silvery pubescence; there is also a dark Y-like mark commencing just below the ocular area and terminating at the base of the cephalic segment. *Clypeus* moderately convex, yellowish, with dark lateral markings, and clothed with fine silvery pubescence; there is a deep transverse curved indentation at centre; lateral radial grooves fairly distinct. *Marginal band* narrow, yellow, fringed with short hoary hairs.

*Eyes* glossy black; of the four comprising the central group, the two constituting the front row are separated from each other by a space equal to about twice their individual diameter, and by rather more than that space from those of the second row; these latter somewhat the largest of this series, and separated from each other by about twice their individual diameter; lateral pairs minute, seated obliquely upon tubercles and nearly contiguous.

*Legs* long, slender, yellowish, with dark brown annulations, clothed with fine short hairs, and armed with rather long black spines; relative lengths 1, 2, 4, 3; the first pair are the longest, the second and fourth somewhat shorter and co-equal.

*Palpi* short, pale yellowish, clothed with short yellowish hairs, and armed with rather long black spines.

*Falces* long, strong, outer margins obscure yellowish, inner margins pale yellow.

*Maxillæ*: outer margins dark brown, inner, pale yellow.

*Labium* dark brown at base, pale yellow from near centre to apex.

*Sternum* shield-shaped, arched, surface uneven, dark brown laterally, with a yellow longitudinal sinuous median patch.

*Abdomen* oblong, moderately projecting over base of cephalothorax, arched; superior surface pale yellowish, deepening to tawny at posterior extremity; a longitudinal, uneven, and broken dark brown bar runs down the centre; at the posterior extremity there are also two short uneven lateral bars; in addition to these there is a series of ten deep lateral dark brown spots or punctures arranged in pairs, commencing near anterior, and terminating

near posterior extremity; lateral ornamentation a broad sinuous dark brown band, beneath which there are alternate wavy striations of white, dark brown and tawny; superior surface and sides clothed with silvery pubescence; inferior surface dark brown with white lateral bars.

*Epigyne* a broad, strongly arched process, dark brown above, yellowish laterally.

*Hab.*—Guildford.

ARGIOPE PALLIDA, sp. nov.

(Plate xvii., figs. 6, 6a, 6b.)

♀. Cephalothorax 4 mm. long, 3 mm. broad; abdomen 9 mm. long, 6 mm. broad.

*Cephalothorax* glabrous, yellowish, with dark brown markings. *Caput* high, arched. *Clypeus* arched, deeply indented at centre. *Marginal band* narrow.

*Eyes* black; the four comprising the central group elevated upon a tubercle; those of the front row slightly the smallest of this series, separated from each other by a space equal to once their individual diameter; the second row of eyes separated from the first by twice their diameter, and from each other by once their individual diameter; lateral eyes minute, the lower ones exceedingly so; these latter seated obliquely on small tubercles, in a line with the front pair of eyes of the median group.

*Legs* long, tapering, pale yellow, armed with short black spines; relative lengths 1, 2, 4, 3.

*Palpi* short, similar in colour and armature to legs.

*Falces* yellow, glabrous; the upper margin of the furrow of each falx armed with a row of three teeth, and the lower with a row of two.

*Maxillæ* concolorous, short, equally as broad as long, convex.

*Labium* concolorous also, subtriangular.

*Sternum* shield-shaped, tuberculate, dark brown laterally, yellow in the median line.

*Abdomen* oblong, convex, moderately projecting over base of cephalothorax; superior surface glossy white, with a few black spots, and ornamented at posterior extremity with four yellow-brown stripes; the latter are pointed in front, retreat gradually, and unite at ultimate extremity; sides white above, yellow-brown below; inferior surface yellow-brown.

*Epigyne* an arched and somewhat conical protuberance, directed towards spinnerets.

*Hab.*—Queanbeyan.

ARGIOPE GRACILIS, sp. nov.

(Plate xvii., fig. 7.)

♀. Cephalothorax  $3\frac{1}{2}$  mm. long, 2 mm. broad; abdomen 8 mm. long, 4 mm. broad.

*Cephalothorax* yellow-brown, glabrous above, fringed in front and laterally with short hoary pubescence. *Caput* moderately high, arched. *Clypeus* convex, arched, deeply indented at centre, radial grooves moderately distinct. *Marginal band* narrow.

*Eyes* as in *A. pallida*.

*Legs* long, tapering, yellow-brown, armed with short black spines; relative lengths 1, 2, 4, 3.

*Palpi* short, yellow, similar in colour and armature to legs.

*Falces* as in *A. pallida*.

*Maxille* yellow, inner margins dark brown; equally as broad as long, convex.

*Labium* yellow, subtriangular.

*Sternum* shield-shaped, tuberculate; yellow-brown laterally, pale yellow in the median line.

*Abdomen* oblong-ovate, moderately projecting over base of cephalothorax; superior surface glossy white, ornamented with a delicate tracery of fine yellow lines commencing at its anterior extremity with a single median line, and terminating at the posterior extremity with a net-work design; there are also two small punctures at the centre; sides and inferior surface dark brown.

*Epigyne* an arched and somewhat conical protuberance directed towards spinnerets.

*Hab.*—Bungendore.

Subfamily GASTERACANTHIDÆ.

Genus DICROSTICHUS, Simon.

DICROSTICHUS MAGNIFICUS, sp. nov.

(Plate XVII., figs. 8, 8a, 8b.)

♀. Cephalothorax 6 mm. long, 7 mm. broad; abdomen 13 mm. long, 16 mm. broad.

*Cephalothorax* pale yellowish, tuberculate, truncated in front, broader than long. *Caput* clothed with short yellowish pubescence, elevated, tuberculate, the tubercles yellow, with the exception of the one carrying the four central eyes, which is black at the summit, reddish-brown at back and sides, and yellow in the front. *Clypeus* broad, convex, tuberculate, reddish-brown at the middle, yellowish laterally, and clothed with short pale yellowish pubescence; tubercles thirteen in number, of these the highest and most prominent is the one constituting the central ocular eminence.

*Eyes* reddish-brown; the four intermediate eyes are seated towards the summit of a large and prominent median club-shaped tubercle; of these the lower pair are the largest; lateral eyes seated in pairs at the extremity of an arm-like tubercular protuberance extending from the base of the median tubercular eminence; these latter are minute and not contiguous.

*Legs* strong, moderately long, pale yellowish, with yellow-brown annulations, and clothed with short yellowish pubescence; relative lengths 1, 2, 4, 3.

*Palpi* short, strong, similar in colour to the legs.

*Falces* yellowish, long, strong, clothed with short coarse yellowish hair.

*Maxille* obscurely coloured, club-shaped, inclining inwards, broadest at apex.

*Labium* concolorous, short, broad, wedge-shaped.

*Sternum* yellowish, hairy, shield-shaped, tuberculate.

*Abdomen* cordate, broader than long, overhanging base of cephalothorax, convex; there are two large yellow lateral tubercles, seated rather lower than midway between anterior and posterior extremities; besides these there is a group of seven small tubercles at the posterior extremity, distributed over three rows, the first of which consists of two, separated by a space equal to about four times their individual diameter; the second row contains three, is curved, the curvature directed forwards, and each of this series is separated from its neighbour by about three times its individual diameter; the anterior extremity is ornamented by a series of eight rather large yellow patches, and six smaller ones; from near the centre to posterior extremity there is a series of rather sharply defined punctures; laterally and underneath the colour is yellowish-grey.

*Epigyne* a long transverse slit.

*Hab.*—Mount Kembla.

*Obs.*—This interesting specimen was taken by Mr. A. G. Hamilton, to whom I am indebted for the privilege of describing it. A full description of its nidification and cocoons will be found in another portion of this paper.

### Family DRASSIDÆ.

Genus CHEIRACANTHIUM, C. Koch.

CHEIRACANTHIUM SILACEUM, sp. nov.

(Plate XVIII., figs. 1, 1a.)

♀. Cephalothorax 4 mm. long, 3 mm. broad; abdomen  $5\frac{1}{2}$  mm. long, 3 mm. broad.

*Cephalothorax* yellowish-brown, glossy, moderately clothed with short hoary hairs. *Caput* high, strongly arched, normal grooves moderately distinct. *Clypeus* convex, with a moderately distinct depression at the centre at junction of cephalic and thoracic segments. *Marginal band* narrow.

*Eyes* of an opaline tint with black rings, and distributed over two moderately curved rows; the lateral pairs are somewhat the smallest, are placed obliquely, and are nearly contiguous; the median pair of the front row are sensibly the largest of the group, and are separated from their lateral neighbours by a space equal to fully twice their individual diameter, and from each other by about one diameter; the median pair of the second row are separated from the lateral eyes by rather more than twice their individual diameter, and from each other by a space equal to fully three diameters.

*Legs* moderately long and tapering, sparingly clothed with yellowish pubescence; the trochanters and femora straw-coloured, tibiae and metatarsi yellow-brown, tarsi black; relative lengths 1, 2, 4, 3.

*Pulpi* moderately long, glossy, tips black.

*Falces* yellowish in front, yellow-brown underneath, long, strong, glossy, slightly divergent at tips, where they are dark brown; outer margins sparingly furnished with yellowish pubescence, the inner margins thickly clothed with long stiff yellowish hairs or bristles; each margin of the furrow of each falx armed with a row of three teeth; *fangs* long, dark brown at base, wine-red at tips.

*Maxillae* long, glossy, club-shaped, yellow-brown, darker at apex.

*Labium* long, conical, yellow-brown at base, dark brown at apex.

*Sternum* shield-shaped, convex, yellow, clothed with moderately long hoary hairs.

*Abdomen* ovate, convex, slightly projecting over base of cephalothorax, pale yellowish; the superior surface ornamented in the median line with a faintly discernible longitudinal bar, from which extends a series of slightly curved branches; the bar indicated commences near anterior extremity, and is rather more than two-thirds of the length of the abdomen; the superior and inferior surfaces and sides are clothed with moderately long but



fine hoary hairs, with a few long coarse dark brown hairs or bristles interspersed.

*Epigyne* slightly elevated, dark brown.

*Hab.*—Guildford.

Family SALTICIDÆ.

Subfamily ATTIDÆ.

Genus ATTUS, Simon.

ATTUS FLAVICRURIS, sp. nov.

(Plate XVIII., fig. 2.)

♀. Cephalothorax  $2\frac{1}{2}$  mm. long, 2 mm. broad; abdomen  $3\frac{1}{2}$  mm. long,  $2\frac{1}{2}$  mm. broad.

*Cephalothorax* yellow-brown, fringed in front with rather long white hairs. *Caput* between the eyes yellow-brown, and furnished with a few short hoary scale-like hairs, lateral ocular area jet black; sides yellow-brown, fringed with short scale-like hoary hairs. *Clypeus* yellow-brown, retreating; the junction of cephalic and thoracic segments indicated by a somewhat shallow depression.

*Eyes* black, almost forming a square; the front lateral eyes placed rather lower down than the posterior ones; central eyes, which are the smallest of the group, seated slightly within a straight line drawn through their front and near lateral neighbours; front median eyes the largest of the group.

*Legs* pale yellow, moderately long and strong, armed with somewhat darker, long and strong spines, and clothed with fine yellowish hairs; relative lengths 1, 2, 4, 3.

*Palpi* short, similar in colour and armature to legs.

*Falces* short, reddish-brown, conical, placed far back behind the frontal margin.

*Maxille* yellowish-brown, somewhat darker at base, club-shaped; inner margins towards apex thickly fringed with yellowish hairs; there are also a few rather long concolorous hairs distributed over their outer and lateral surfaces.

*Labium* concolorous, rather long, conical, arched, and furnished with a few rather long coarse hairs.

*Sternum* yellowish, shield-shaped, convex, lateral edges fringed with rather long yellowish hairs, the surface moderately clothed with short yellowish pubescence.

*Abdomen* ovate, moderately projecting over base of cephalothorax, dun-coloured; the superior surface ornamented with two broken longitudinal lines of a somewhat darker colour; these commence well forward and terminate near posterior extremity, below which there are again two strongly curved concolorous transverse bars, the curvature directed backwards.

*Epigyne* a dark somewhat circular protuberance, uneven in outline, and hollow within.

*Hab.*—Guildford.

In pursuing the study of the architecture of the Araneidæ, the student cannot fail to be struck by the poverty of the literature on the subject. In so far as Australia is concerned, practically nothing has been done, and yet the wealth of material at hand is so vast, that the wonder is it should have remained so long neglected. Singularly enough what is true of Australia is equally so in regard to other countries. To be sure, some authors, such as McCook\*, Wagner†, and Cambridge‡ have given the matter great attention, but the majority of writers seem content with merely describing species, and publishing on rare occasions a few fragmentary notes, while others draw their conclusions from observations on the work performed by spiders when in captivity. In many instances these are misleading, because a captive often constructs an edifice entirely different from the one invariably met with in its natural haunts. Nevertheless it will be readily conceded that much valuable knowledge may be gained by intelligently noting the habits of these creatures when in a state of captivity, and comparing the observations with those acquired in

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\* American Spiders and their Spinning Work; also various papers in the Volumes of Proceedings of the Acad. of Nat. Sciences, Philadelphia.

† L'Industrie des Araneina. Mém. de l'Acad. Imp. des Sci. de St. Pétersbourg. vii<sup>e</sup> Série, Tome xlii. No. 11, 1894.

‡ Spiders of Dorset.

the field. *Gasteracantha bispinosa*, Keys., is a case in point. This spider in its natural haunts constructs an orbital snare, but in captivity the fabric consists of a number of lines thrown seemingly at random. Two specimens kept by me at different times, although provided with ample room, and placed in a suitable position for light, constructed webs of a nondescript design, but upon being liberated in my garden, resorted to their customary form of architecture. Again, the snare of *Agelina labyrinthica*, Walck., is very different in confinement from the one it fabricates in its natural sphere. Spiders of this genus are very common in the County of Cumberland. They are found in scrub lands, and on a variety of soils, being common on sandy hills around Sydney, and again in the heavier loamy districts at Guildford and Fairfield. The snare of *Agelina* is constructed under the cover of some bush or shrub, close to the ground, the upright stems of weeds, grasses, or other convenient projections being used for the purpose of supports. The snare itself is a veritable labyrinth. From the main body of the web a tunnel is constructed, running into the ground in an oblique direction. In this the spider rests, until apprised, by the vibration of the mesh, of the capture of some unwary insect, whereupon it rushes out, and having secured its prey, carries it into the silk-lined burrow, there to devour in peace its unhappy victim. In captivity, the snare is not nearly so complex, as I have proved by keeping specimens at various times. For the purpose of observation I placed one of these spiders in a box about a foot long, nine inches broad, and eighteen inches deep, having previously put sufficient soil to cover the bottom to the depth of four inches. At first the creature was somewhat shy, but at length it picked up sufficient courage to survey the extent and surroundings of its prison. Having satisfied its curiosity, it betook itself to one of the corners of the box, and remained perfectly quiet, evidently quite undesirous of being watched. Noting this, I left it to itself for a while, and upon visiting it again, found that it had stretched several lines of silk the length of the box, and about midway between the soil and the lid. After this a number of other lines were drawn from

different positions along the sides of the box, but all converging to one point, which afterwards proved to be over the site selected for its subterranean gallery. Having progressed so far, it now turned its attention to the formation of the tunnel that was to connect the gallery with that part of the web intended to be used for ensnaring its prey. Upon the construction of this important adjunct, she bestowed a great deal of time and labour, but although commencing it before excavating the burrow, the little worker did not attempt to complete it until she had finished her digging operations. As she proceeded with the excavation she spun line after line of silk, both around, and up and down to prevent the sides falling in, which would inevitably have resulted on account of the loose and free nature of the material upon which she was working. The excavation having at length been completed, she set to work to finish the tunnel and the snare, stretching lines the length of the box, interlacing them with other threads from every conceivable point and angle, until at length she had produced a network of beautiful fine silk, but of an exceedingly irregular design. The fabric of the tunnel was of a much closer texture than that of the body of the web. The snare itself took the form of a somewhat flattened sheet, but had a marked depression towards the mouth of the tunnel; nevertheless the structure was entirely devoid of the labyrinthine lines peculiar to the snare as seen in the bush. Wagner, in commenting upon similar observations and experiments recorded by Rossi and Lister, remarks:—"This is comprehensible: the architect in captivity lacks the material that it employs in a state of liberty; besides this the spot for building is not that chosen by herself, but one given by the observer; yet most frequently the descriptions of nests relate to those formed in captivity, and the constructions built under these conditions are accepted as normal."<sup>\*</sup>

From the foregoing notes it will be seen how exceedingly unwise it is to draw conclusions solely from observations made on animals

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<sup>\*</sup> *L'Industrie des Araneina*. Mém. de l'Acad. Imp. des Sci. de St. Pétersbourg. vii Série. Tome xlii. No. 11, p. 4.

kept in captivity. At the best they can but form a clue to their life-histories, although at times they may be useful in assisting to elucidate problems encountered in the field. Upon this question I am fully in accord with Wagner, when he says :— "Such descriptions are prone to great error, because certain spiders which, in liberty place their cocoons on the *outside* of their snares, in captivity, and with new surroundings, often change the position; thus a species which habitually establishes its cocoon at a distance from its snare will, in captivity, place it either above or at the side. This is not the result of new conditions, but simply the impossibility to do otherwise owing to its environment; nevertheless such incidents are often taken as normal phenomena."\*

In applying myself to the study of the architecture of Australian Araneidæ—so far as the present paper is concerned—I propose to deal first with the *Epeiridæ*, secondly with the *Drassidæ*, thirdly with the *Salticidæ*, and fourthly with the *Thomisidæ*, and to note in illustration of the spinning-work of these creatures such examples as have come under my own observation.

#### EPEIRIDÆ.

The spiders of this family, owing to their habits and modes of life, are undoubtedly one of the most prominent groups in the whole of the *Araneidæ*. To the casual observer they are familiar by their orb-like snares which are always located in more or less exposed positions. The mode of weaving the typical snare has been so often and so fully described that it would be superfluous and wearisome here to enter into minute details. Indeed, considering how common and prominent they are, it would be strange if they had not at an early period attracted notice. At the same time, it must be borne in mind that the habit of fabricating orbital snares is not absolutely constant in the *Epeiridæ*. Cambridge has drawn attention to a species of this extensive family that does not do so. In reviewing Thorell's great work† the eminent

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\* *Loc. cit.* pp. 4, 5.

† Remarks on the Synonyms of European Spiders. Upsala, 1869-70.

English arachnologist says\* :—"Dr. Thorell was necessarily unacquainted with an undoubted Epeirid (a native of New Zealand, and as yet undescribed), observed and beautifully figured by Dr. Llewellyn Powell, belonging to the genus *Arachnura*, Vinson. This spins only a few irregular threads, crossing each other at various places, among twigs or small branches and stems of herbaceous plants, very similar to some spiders of the genus *Theridion*, family *Theridioides*."

Often when wandering along country roads the eye of the traveller lights upon some huge web, the outer lines or guys of which are frequently from 30 to 40 feet in length, and occasionally even more. Sometimes these lines are stretched from tree to tree, across roads over which there is constant vehicular traffic, and at other times bridging streams. On one occasion I saw a web, the main line of which was thrown athwart the South Head Road, near Belle Vue Hill, the objects to which the ends were attached being a tree on one side and a telegraph post on the other. By a well-directed stone I succeeded in bringing the builder down. It proved to be *Epeira herione*, L. Koch. It is remarkable, considering how fragile these structures are, the amount of wind pressure they can bear—a fact that can only be explained by their elasticity. The time when orb-weavers are most active is after sunset. It is then that they fabricate their orbitular snares. Usually from half-an-hour to forty minutes is sufficient to complete the work. The long bridge-lines, so far as my observations have gone, and I have noted a good many, have always been wind-borne, and, moreover, their length is affected by this agency, that is to say, a spider when setting out upon the task of constructing a web can have no choice in the selection of a suitable attachment opposite to the one from which it emits its thread. The line thrown out is carried by the air-current, and continues to float until the free end strikes some object to which it adheres. There may be other equally suitable objects nearer than the one to which it finally attaches, but they escape for the

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\* Ann. Mag. Nat. Hist., Vol. vi., 4th Series, 1870, p. 116.

simple reason that they are not to leeward of the spider and the prevailing air-current. In his work on "The Spiders of Dorset," Cambridge says:—"Spider lines may frequently be observed strained across open spaces of many feet and even yards in extent. This has been explained by some naturalists to have been done by the help of a current of air carrying the thread across. I cannot, of course, say that it has never been thus effected; though I have certainly never myself witnessed it. I have, however, on several occasions seen a spider fix its line, then run down to the ground, across the intervening space, and so up the opposite side, trailing its line as it went, and then, having hauled in the slack, it fixed the line to the desired spot. This I believe to be the usual mode of proceedings in such cases"\* In addition to this, it is only fair to say that in the second volume of his work, and after further investigation, the distinguished author modified the expression of opinion just quoted.

The webs of spiders of the genus *Gasteracantha* are always placed low down, sometimes only two feet from the ground, and are of varying lengths. Some that I have measured were only three feet in length, and some even less, while others were fully six. These webs are generally found in rough, scrubby localities, in which the intervening spaces between the two points of attachment are such that it would be very unlikely indeed for the architect to be successful in any attempt to carry its thread from one point to another. One evening last summer I watched a spider (an Epeirid) that had located itself on one of the highest spurs of a rose bush. It threw out a line of silk, but owing to no suitable attachment being in line with it and the direction of the prevailing air-current, it failed to secure a connection. Nor was it content with one trial, but made repeated efforts to achieve its object. After the lapse of an hour I took the spider from the position it had selected and placed it on another shrub, opposite to which, and in a line with the air-current, another plant was standing, and although it made no attempt to repeat the efforts just narrated before I retired, I found upon visiting the spot next morning that it had succeeded in fabricating its snare.

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\* Spiders of Dorset, Vol. i., Introduction, p. xxi.



It will be conceded, therefore, from the facts here stated, that the bridge-lines of webs are influenced by the direction of air-currents. At the same time I am free to admit that in the case of webs constructed within a narrow space, and where the bridge-lines are short, spiders do sometimes carry the line to the opposite point of attachment.

In 1881 Dr. McCook, at the close of an interesting address delivered before the Academy of Natural Sciences, Philadelphia, said :—" While this use of air-currents is certainly placed beyond doubt, it is as certainly not the only mode of laying foundation-lines, and is dependent very much upon the site chosen, the condition of the wind, the abundance of prey, etc. Webs built in large open spaces are perhaps always laid out by bridge-lines [*i.e.*, lines carried by air-currents.—W.J.R.]. In more contracted sites, the frame lines are generally carried around, and often a foundation is the result of both methods."\*

Some time ago it was my good fortune to discover what may certainly be considered an extraordinary web. This peculiar snare was stretched between three large shrubs, the situations of which described a triangle (. . .), and was what may be denominated, for want of a better term, a "double" web. The main body of the mesh consisted of the typical orb, with the customary outer lines or guys, but at the back, and running down the centre, the spider had placed a semi-orb. I spent a long time in looking for the interesting architect, but without success, and it is quite possible it may have fallen a prey to some insectivorous bird. Other orbitular snares are occasionally met with, having cords attached to the centre or "hub," drawn taut, and firmly secured to a branch or trunk of a tree, thus causing the snare to be sharply depressed, the object being, doubtless, to strengthen it against the wind.

Snare-fabricating spiders form two great tribes: the *Orbitulariæ* and *Retitelariæ*; the webs of the former are more or less geometrical, orb-like, in most instances erected in a vertical position, though sometimes oblique, and in some instances hori-

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\* Proc. Acad. Nat. Sci. Philadelphia, 1881, p. 435.



zontal; those of the latter are festoons fabricated in corners or angles of buildings, and among the small branches of shrubs, or under the overhanging ledges of rocks, and consist of irregular lines extending from every conceivable point and angle, crossing and interlacing each other. Amongst our endemic *Epeirida* there are some species that construct composite webs—that is to say, in addition to an orb-like snare, there is a network of irregular or retitelarian lines, such, for example, as those described by me in connection with the web of *Epeira wagneri*, Rainb., in a former paper.\* Whilst taking a ramble at Guildford last spring, I was so fortunate as to discover an exceedingly interesting web of the composite type, but very different to the one just referred to. This was the snare of *E. crassipes* (*ante*, p. 515). The orb-like mesh of this spider is always suspended horizontally, and the radii and concentric rings are exceedingly fine and closely woven. This portion is about 9 inches in circumference. The centre of the orb is looped up, giving it a somewhat tent-like appearance. Above the orb a cone-shaped nest or retreat is suspended, mouth downwards, and from the interior of this there are lines connecting it with the main body of the structure. The accompanying figure is a diagram of the upper portion of the web in profile.

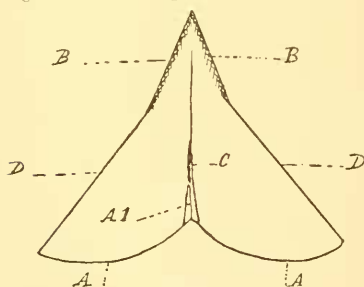


Fig. 1.

A represents the orb which is looped up at A1; B the nest or retreat; C the lines looping up the orb; and D the centre lines stretched from the lower portion of the nest to the edges of the orb. The nest is skilfully made. It is composed of colourless silk, among the threads of which

dead leaves of *Leptospermum* or ti-tree are woven, thus affording not only an admirable shelter from the weather, but also a protection from the raids of predatory

\* P.L.S.N.S.W. 1896, Vol. xxi. pp. 335, 336; *E. sylvicola*, described in this paper, *ante*, p. 518, constructs a web and nest exactly like *E. wagneri*.

birds. In this secluded retreat the female dwells in company with her mate, until at length, getting tired of his company and attentions, the latter has to beat a retreat, or fall a victim to her rapacious appetite. Being now left in complete and undisturbed possession, the female immediately sets to work to increase the size of her dwelling, after which the egg-bags or cocoons are made and placed therein. These are usually four in number, spherical, and somewhat varying in size, and contain on an average about 200 eggs each; these are of a pale yellowish colour and exceedingly glutinous. The walls of the cocoons are somewhat loosely and thickly constructed, and are of a pale yellowish colour; attached to their loose threads are a number of minute, hard, silken pellets, some of which are white and some dark green. The cocoons are always suspended inside the nest, one under the other, the mother mounting guard until the young hatch out. In addition to the orbitular portion there is a perfect labyrinth of lines both above, below, and surrounding it. Enclosed also within these retitelarian lines, but seated below the orb, a "floor" or horizontal curtain of web is constructed, much like that of the snare of *E. basilica*, McCook.\* *E. pallida* (ante, p. 514) fabricates a snare and nest like the one just described. The young of these spiders live together in communities during the first two or three months of their existence; each youthful Epeirid after undergoing the first moult, constructs its own snare, with retreat, orb, floor, and retitelarian lines complete, the outer lines or guys of each miniature web joining that of its neighbour's. So numerous are these young spiderlings that their united webs often completely envelope large shrubs. It will thus be seen that some orb-weavers unite with their beautiful and typical snares the principal features of the line-weavers' webs, thereby apparently forming, to quote McCook,† "a perfect link between the orb-weaving and line-

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\* Proc. Acad. Nat. Sci. Philadelphia, 1878, pp. 124-127.

† Loc. cit. p. 127.

weaving spiders in the characteristic spinning-work of the two groups.”\*.

In a former paper† I described and figured the leaf-rolled nest of *Epeira wagneri*, Rainb. During the month of December, last year, I had the opportunity of studying the life-history of the young of this species, and noting their progressive development. The first specimen I examined, and which was somewhat the youngest of the new brood, the spiderling had constructed a silken cell on the spur of a branchlet of a ti-tree, the form and architecture being very similar to the nest of a Drassid; another (somewhat older) had selected the under surface of a leaf of a turpentine tree, across the centre of which it had spun a simple sheet of web; this nest was so constructed that its tenant could make an exit either at one end or the other, and was very primitive in design; a third individual took up its abode upon the upper surface of a leaf of the same tree, and had constructed its nest in much the same manner as the foregoing; a fourth had selected the underside of a small leaf of a turpentine tree that was suffering from the depredations of some insect pest, and from the effects of which it was curled and twisted out of its natural shape. This naturally formed a good shelter both from the weather and insectivorous birds. The nest consisted of a rather long silken tube, the entrance to which was towards the apex of the leaf. Other individuals, somewhat older, made their nests similar to those of the adult spiders, but always in proportion to their size. These they discard for larger habitations as they increase in bulk. One web that I examined had two of these leaf-nests, the smaller of which had evidently been very recently discarded for a larger tenement; the proof of this lay in the fact of the presence of the exuvie from a recent moult. All the leaf-nests described were

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\* *Loc. cit.* pp. 124-132. McCook describes at considerable length and illustrates with numerous figures the webs of several American spiders of the genera *Epeira* and *Linyphia*, the object of which is to trace an analogy between the spinning-work of the two groups (*q.v.*).

† P.L.S.N.S.W. 1896, pp. 335, 336, pl. xix. figs. 2*a*, 2*b*, 2*c*.

attached to webs typical of this species, and thus formed a good object lesson in their progressive architectural development.

*Argiope extensa*, Rainb., and *A. protensa*, L. Koch, construct their orbital snares upon bushes, and are generally placed low down. The egg-bag or cocoon of each is spherical, and about the size of a pea. The eggs are green, and being only thinly enswathed with fine colourless silk, the cocoons appear upon a superficial examination to be of a light or pea-green colour. *A. regalis*, L. Koch, is a very common spider in the County of Cumberland, although its range is by no means restricted within that area. In the centre of its snare there is always a large X-like cross, the lines of which are zig-zagged. These being broad and white form a striking contrast to the fine, colourless lines of the orb. When reposing in the centre of the mesh, the animal spreads out its legs so as to describe an X, each pair being placed closely together. The males are veritable pigmies in comparison with the females, though in proportion to their size the legs of the former are considerably longer. When pairing the sexes inhabit the same web, the female occupying the centre as usual, and the male the upper edge. The endeavour to ingratiate himself with the object of his choice is not without the element of danger, and even when he succeeds in so doing he seldom escapes scatheless. Before leaving his post he always tries the tension of the web with his feet, after which he runs down nimbly and lightly, so as not to attract her attention, climbs on her back and remains for a time in that position. Should she not succeed in dislodging him, he next



Fig. 2.

endeavours to climb down to the underside of her abdomen, where having attached himself in the necessary position, and with

his legs firmly grasping her abdomen, the act of copulation is performed, after which he has to be very active in dropping out of the web, and placing himself beyond her reach, or else he will pay the penalty with his life.

Although of the tribe *Orbitulæ*, *Dicrostichus magnificus* (*ante*, p. 523) does not fabricate an orbital snare. The web of this species is of a distinctly retitelarian character. The nest is composed of a number of dead leaves (Fig. 2), and were it not for the silken threads with which they are bound together, would put one in mind of a miniature bird's nest rather than that of a spider's. The tube or retreat is long, lined with silk, and very cleverly constructed.\* Attached sometimes to leaves connected with the nest,

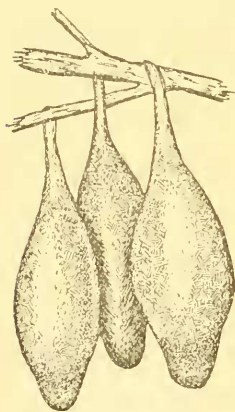


Fig. 3.

and sometimes to adjacent objects, sticks, &c., are the egg-bags or cocoons (Fig. 3). These vary in number: usually there are three, but occasionally five. The cocoons are of a pale yellowish or straw-colour, about  $3\frac{1}{4}$  inches long and  $2\frac{1}{2}$  inches in girth at their widest part. Each cocoon has a narrow neck about three-quarters of an inch in length, after which it bulges out strongly until the maximum width is attained; from thence it gradually tapers off, terminating finally with a blunt, rounded point. The walls of the cocoons are exceedingly closely woven, smooth, and

tough; within they are sparingly lined with loose, colourless silk. Surrounding the nest there is a numerous array of retitelarian lines, crossing and interlacing each other from every possible angle. The whole structure is exceedingly complicated, and, so far as the web is concerned, there is no attempt whatever at design. The denser portion of the mesh is placed at the side, and as near as possible on a line with the nest. Often when rambling through

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\* I am indebted to my colleague, Mr. Edgar R. Waite, for the excellent drawing of the nest of this spider.—W.J.R.

the bush in quest of specimens, and for purposes of observation, I have noticed these cocoons, but was never successful in obtaining a specimen of the architect responsible for the structure. I have also, at various times, had specimens of these cocoons sent me for determination, but always without the spider. It is to Mr. A. G. Hamilton, of Mount Kembla, that I am indebted for the specimen described in this paper, and also for a photograph of the creature, with its nest, and cocoons *in situ*.

Speaking generally, the Epeiridæ do not all construct tube-nests or retreats. Among those that do so, *Epeira wagneri* and *E. sylvicola* are never seen resting at the centre or "hub," as is the usual custom with orb-weavers; on the contrary, they are always to be found within their rolled-leaf nests. Whenever an insect becomes entrapped within the mesh, these spiders immediately rush out and enswathe the struggling victim in the usual manner of the *Epeiridæ*. Among other groups, as the *Drassidæ* and *Attidæ*, for example, a tube or nest is made for the purpose of taking shelter during the period of moulting, as will be explained in another part of this paper, but with the *Epeiridæ* this is not so. When the time arrives for an Epeirid to cast its skin, it quietly settles down wherever it may be to undergo the process, which is proved by the positions in which exuvie are frequently found.

#### DRASSIDÆ.

Among the species described in the present paper one is referable to the family *Drassidæ*, i.e., *Cheiracanthium silaceum*. The spiders of this family reside in silken cells which they construct in the crevices of rocks and walls, amongst leaves, under stones, and the exfoliating bark of trees, and capture their prey either by surprise or pursuit. They are generally of small size, of neat and compact form, and exceedingly active. The cocoon of *C. silaceum* is placed within the cell or nest, and consists of two white plaques, between which the eggs are placed. The nest itself is about the size of a walnut, its bulk being caused by the little architect weaving dead *Leptospermum* leaves among the silken

filaments, thereby affording absolute immunity from the attacks of insectivorous birds; but it must be understood that the leaves are only introduced into those structures that contain cocoons, the nests occupied when moulting consisting only of the usual white silk, and being free from foreign substances. During the periods of moulting or maternity, the entrance to the nest is always securely closed. Nothing can exceed the maternal care, devotion and self-abnegation of *C. silaceum*, for not only does the mother mount guard over her eggs, but absolutely refrains from leaving them even for a moment, and abstaining entirely from food, not only until after they have hatched out, but until they have become old enough and strong enough to quit the nest and start in life for themselves. The retreat—nest—is constructed at the spurs of shrubs, is white and open at each end, and serves as a shelter from the weather, or for repose and for protection from enemies.

The spiders of the genus *Clubiona*, Walck., have been classified by most authors (Walckenaer, Westring, Ohlert, Staveley, Simon, Thorell, Dahl, and others) with the *Drassidæ* but Wagner (in a paper which I have not yet seen\*) has allotted it to a separate family, *Clubionidæ*, of which it is the sole representative. In so far as the architecture of the species is concerned, there is much in common with other representatives of the *Drassidæ*. The spiders conceal themselves in silken cells which they construct either on or among the leaves of plants, in the crevices of walls or rocks, under stones, among the rugulosities of trees, and behind exfoliating bark. In the capture of their prey, which they take either by surprise or pursuit, they display great activity. In connection with the question of their architecture, it is only right here to explain that it consists of three distinct types: (first) the *retreat*, consisting of a silken tube with two apertures, in which the spider dwells during those periods when she is not moulting,

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\* "Observ. s. l. Araignées," Bull. de la Soc. des Naturalistes de St. Pétersbourg, 1880; see also "L' Industrie des Araneina," Mém. de l'Acad. Imp. des Sci. de St. Pétersbourg, vii<sup>e</sup> Série, Tome xlii. No. 11, 1894.



and when she is free from maternal cares; (second) the *nest* wherein the animal moults, or in which the cocoon is established; and (third) the cocoon containing the eggs.

In the construction of the retreat varying degrees of perfection are displayed, and these are influenced by circumstances, such as the length of time a spider occupies a nest, for it not infrequently happens that after establishing a home in one locality it will reject it for another, probably out of consideration for its larder, the position taken up in the first instance not being sufficiently productive; again, another reason for changing may arise from exposure to disturbance or attack. It may, therefore, be laid down as a law that the higher or lower the degree of perfection attained is due entirely to the length or brevity of the spider's sojourn in the retreat. This fact has been recorded by Wagner,\* who, in explanation, observes that "the shorter its sojourn, the simpler the structure of the retreat; the longer the sojourn of the animal the greater is the quantity of silk used, and the more careful the workmanship in the construction of the retreat" [plus il est court—plus simple est la structure de la retraite, et inversement: plus longtemps y reste l'animal—plus grande est la quantité de fils, qui s'accumulent, et plus soigneusement se fait la retraite.] When the retreat is constructed on the spur of a shrub, such as the ti-tree or *Leptospermum*, as in the case of *Clubiona modesta*, Koch, it is secured by threads to the stem and its leaves, but when on the other hand a broad leaf is selected, the spider takes up its position on the reverse side and draws the edges over, binding them in position by a series of threads. In describing the retreat of *C. pallidula*, Clerck, Wagner has given a series of figures† elucidating the manner in which the edges of the leaf are brought together, and as the *modus operandi* is the same throughout the species, they may be briefly explained. The first figure (fig. 161 on the author's plate) represents a transverse section of

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\* *Loc. cit.* p. 119.

† *Loc. cit.*, pp. 119-122, Pl. II. figs. 161-164.



the leaf with the first series of threads stretched from edge to edge, so as to describe the arc of a circle; the second (fig. 162) represents the leaf still further warped over by the second series of threads, so that it now forms a semicircle; the third figure (fig. 163) illustrates the result of the third series, the circling of the leaf being nearly complete; and the fourth (fig. 164) the leaf completely circled. The first series of threads are irregular, and apparently carelessly drawn, but as the work proceeds towards completion greater attention and care are displayed. It is not until after the completion of the third stage in the circling of the leaf that any attention is bestowed upon the interior of the tube. Up to this time the spider has confined her attention and energies solely to attaching silk to the edges of the leaf, but now she commences the work of fabricating the internal tapestry and lining the walls of her retreat, putting in the final touches after the edges have been brought together. It sometimes happens that in the neighbourhood of the leaf selected there is a second, and occasionally a third leaf. In such circumstances the spider, working purely upon instinct, incorporates them in the tube. This is illustrated by the retreat of *Drassus perelegans*, described and figured by me in a former paper.\* Again, to quote Wagner,† if during the task of warping a leaf the spider is prevented from bringing the edges closely together by the observer placing a small stick between them, she is not at all disconcerted, but proceeds immediately to enclose the aperture with a wall of silk, by passing her abdomen from side to side over the spot. Again, if the stick be removed, the edges of the leaf will soon unite without any effort on the part of the worker, owing to the contraction of the silk [rien qu' à cause de cette élasticité de la soie elle-même].

The difference between the *retreat* and the *nest* is that the latter is closed at both ends, and that it is larger, more solid, and, if

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\* P.L.S.N.S.W. Vol. ix. (Series 2nd), 1894, p. 154, fig. 1a.

† *Loc. cit.*, p. 120.

anything, more skilfully built. When the periods of moulting or maternity approach, the spider retires to the seclusion of her nest and shuts off all communication from without by closing the apertures. The cocoon is composed of two closely fabricated layers or plaques of silk, the threads of which are crossed and recrossed, and between which the eggs are placed. This is stretched horizontally, the edges adhering to the walls of the nest. During the period of incubation the female mounts guard over her eggs, which she maintains until the young hatch out. But her vigilance does not end there, for until the spiderlings are old enough and strong enough to start in life for themselves, the mother continues to display great solicitude for their welfare. From the time that she enters her nest, and until the brood disperse, the mother remains an absolute and willing prisoner, never once quitting it even for food. By way of illustration of the tenacity with which the mother will cling to her cocoon, I may mention that on one occasion after breaking a nest open, the spider steadfastly refused to budge from her treasure, and even when I proceeded to tear the cocoon with my forceps she still maintained her grasp; and further, when she was eventually removed, it was with the loss of two of her legs.

In those parts of our country favoured by mild winters many species do not hibernate.

#### ATTIDÆ.

The *Attidæ* are individually exceedingly small spiders, and embrace among their number some of the brightest coloured examples of the Araneidæ, as, for example, *Attus volans*, Camb., and *A. splendidus*, Rainb. Their principal haunts are crevices and interstices of walls and rocks, fissures in the ground, the rugulosity of trees, shrubs, and exfoliating bark. So far as their nesting habits are concerned, they closely resemble the *Drassidæ*.\*

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\* In connection with this remark, Wagner observes, in speaking of the *Attidæ*:—"In certain features of their architecture they approach the *Drassidæ*; in other features, the spiders of other groups."—*Loc. cit.*, p. 76.

Their architecture consists of a retreat in the form of a tube with two apertures; a nest in which they (1) moult, and (2) in which they seclude their cocoons, but to which there is no aperture; and finally the cocoon. These spiders are active during the day-time, and capture their prey either by surprise or pursuit. In the art of stalking prey they are exceedingly skilful. In this they are aided by keenness of vision, in which respect, throughout the whole of the Araneidæ, they have no superior. The subject of vision, however, is not within the province of this paper, and and must therefore be held over for a future occasion; but as the question has been raised, it is only fair to say that a number of eminent authors have recorded both observations and experiments proving conclusively that length of vision is possessed by the *Attidæ* to a rare degree. Among these are Cambridge, Simon, McCook, and Dr. and Mrs. Peckham. Of these the last named writers, after enumerating a long series of experiments, conclude with the following observation:—"We think that our experiments on vision prove conclusively that *Attidæ* see their prey (which consists of small insects), when it is motionless, up to a distance of five inches; that they see insects in motion at much greater distances; and that they see each other distinctly up to twelve inches. The observations on blinded spiders and the numerous instances in which spiders were close together and yet out of sight of each other, showed that they were unconscious of each other's presence, render any other explanation of their action unsatisfactory. Light guides them, not smell."\*

Among the Australian *Attidæ* there are many species that do not make a retreat at all, but content themselves with the seclusion afforded by objects within the compass of their sphere of activity, such as nooks and crannies in walls and rocks, the spaces under stones, fissures, and such like. On the other hand, there are some species that seem to be guided more by caprice than

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\* "The Sense of Sight in Spiders," by George W. and Mrs. Elizabeth G. Peckham. Trans. Wisconsin Acad. Sci., Arts, and Letters, Vol. x., p. 249.

anything else, and which seem to be perfectly indifferent as to whether they fabricate a retreat or nest, or whether they adopt for their use the untenanted habitation of other species, and even the deserted cocoons of insects. I have, for instance, found individuals occupying empty cocoons of a cup moth (*Doratifera*), while others of the same species, and in the same locality, were lurking within silken tubes.\* Speaking of this feature of their natural history, Wagner says :—"It is *à propos* to note here that of all the spiders with which I am acquainted, the *Attidæ* are the greatest amateurs [les plus grands amateurs], and during moulting or nesting take possession not only of those of other families such as the *Clubionidæ*, *Drassidæ*, *Theridiidæ*, &c., but even those of insects, as well as those of other animals."† The nest, when one is made, closely resembles the retreat, differing from it in so far that it is never open, and that the walls are thicker and more closely woven. The cocoons are spherical, thinly and loosely woven, and look very like a ball of fluff, and are always secured to one of the walls at the centre of the nest. During the period of incubation and the early days of the infancy of her progeny, the female never quits the nest: the young ones remain for a considerable time with their parent, but she never procures nourishment for them, nor, indeed, do they require any until after their first moult. When, however, this has been accomplished, they leave their home, and commence to hunt and stalk their prey.

An old writer, Evelyn, in his work, "Travels in Italy," gives a remarkable and lively description of the tactics adopted by these spiders in hunting and stalking their prey, which, to say the least, is decidedly amusing, and concludes his remarks by observing. "I have beheld them instructing their young ones how to hunt, which they would sometimes discipline for not well observing: but when any of the old ones did (as sometimes) miss a leap, they

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\* Since the above was written I have found representatives of the *Attidæ* dwelling within the interior of the dead bodies of beetles.

† *Loc. cit.*, p. 68.

would run off the field and hide themselves in their crannies, as ashamed, and haply not be seen abroad for four or five hours; for so long have I watched the nature of this strange insect, the contemplation of whose so wonderful sagacity and address has amazed me; nor do I find in any chase whatsoever more cunning and stratagem observed. I have found some of these spiders in my garden, when the weather towards spring is very hot, but they are nothing so eager in hunting as in Italy."

So far as my experience goes, the system of architecture described in respect of the *Attidæ* is the same throughout, but Wagner has described and figured the nest of *Attus hastatus*, Clerck,\* which differs very widely from the foregoing, and which, taken all in all, is of unique interest. This spider appears to prefer the pine for its haunt, as it is only upon that tree that the distinguished araneologist has found it, and as he is a particularly careful and astute observer and an industrious collector, he would have found it in other situations if it affected them. Among the twigs of a branch of a pine, either living or dead, *A. hastatus* constructs its nest. The shape, according to the figures, is almost spherical, and the silken threads are irregularly interlaced. The abundance of silk used in the structure, and its similitude in construction to the cocoons of some Lepidoptera, affords excellent protection. A tube or tunnel runs through the structure, and at each end there is an oval aperture for ingress or egress. The nest is thus divided into two parts, an upper and a lower, and of these the latter is somewhat the larger. At night the spider reposes in the tunnel, and secures herself from attack by closing the apertures. The cocoon, which is oval, is placed in the lower half, and at a distance from one of the openings of about one-third the length of the tunnel, and a little below its "floor." The walls of the tunnel are very thick, although the silk of which they are constructed is loose and flocculent. Obviously a structure such as the one described must naturally form an absolute protection both for the eggs within the cocoon and for the young when they have

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\* *Lot. cit.*, pp. 74, 75, Pl. v. fig. 100, Pl. iv. fig. 101, and Pl. x. fig. 102.

hatched out and until they are old enough to shift for themselves. As with other species, the young of *A. hastatus* remain for a long time with the mother. A further point of interest in connection with this species is that the female uses the same nest for successive broods, and that frequently after the young have been hatched out from one cocoon, and before they are old enough to start in life for themselves, another batch of eggs is deposited. Upon the approach of danger the young ones seek shelter among the labyrinthine threads of the huge structure. As an instance of the cannibalism of *A. hastatus*, Wagner states that he has found it in the nest of *A. falcatus*, Clerck, feeding upon the eggs contained in the latter's cocoon, after having devoured the rightful owner.\*

In respect of the *Attide* it only remains to be added that among those species that do not construct a retreat in which to shelter from predatory foes and inclement weather, or to seek repose during the night, some of the members suspend themselves by means of a thread from the branches of shrubs. In this position, with their legs folded across the clypeus, they are not only enabled to pass the night in peace, but also enjoy complete immunity from their natural enemies. Anyone who will take the trouble during the summer time to examine the shrubs of our scrub lands, or even plants in gardens, may see numbers of these spiders in the position described. Wagner, in support of his statement, says: "I have had occasion to observe this phenomenon in nature, as well as in captivity."†

#### THOMISIDÆ.

The spiders of this family are, in popular parlance, known as "Crab-spiders," owing to the form and arrangement of their legs, which are laterigrade, and which present much diversity in their relative proportions; classical naturalists, however, have named

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\* *Loc. cit.*, p. 75.

† *Loc. cit.* footnote on p. 67.

them "aerial" or "gossamer spiders" on account of their habit of transferring themselves from one locality to another, a feat, however, not solely confined to the representatives of this group. Many species of *Thomisidæ* frequent the summits of branches, flowers, and high plants or shrubs, and often form connections between objects widely separated from each other by means of long, single threads of silk, while others conceal themselves amongst herbage, the rugulosities of trees, or in cracks and crevices of rocks or walls. The various species seem to be admirably adapted to their natural haunts both by form and colouration, and often assimilate inanimate objects, both for the capture of prey and as a protection from predatory foes.

The *Thomisidæ* is an extensive family, and has a wide geographical range, but by far the greatest number of species and individuals are found in tropical and subtropical regions. Wagner includes in this family only three genera—*Misumena*, Latr., *Thomisus*, Walck., and *Xysticus*, C. Koch.\* *Sparassus*, Wall., and *Micrommata*, Latr., are allotted to a separate family, for which he proposes the name *Sparassidæ*.† Simon,‡ on the other hand, includes within the family no less than six sub-families, with numerous genera.

In writing upon the spiders of the *Thomisidæ*, Wagner, in his great and interesting work, says :—"None of the representatives of these spiders make a retreat nor a construction for moulting. The rejected teguments are found on the leaves without any adaptation" [for moulting].§ In dealing with the question of the architecture of the Araneidæ, *per se*, Wagner is exceedingly careful and accurate, and his expressions and opinions must therefore be treated with respect. Indeed, speaking generally, the statement just quoted is correct, but then this eminent author was naturally unaware of the ingenious nest made by a spider (at

\* *Loc. cit.* p. 49.

† Observations sur les Araneina, pp. 119, 120.

‡ Hist. Nat. des Araignées, 2nd Ed., Vol. i., pp. 953, 954.

§ *Loc. cit.* p. 49.



present undescribed, and for which a new genus will be necessary), an undoubted Thomisid—a species of *Misumeninae*.

This interesting spider constructs a bag-like nest which it attaches to branches or twigs, and which is held securely in position by silken threads. The entrance to the nest is at the top. The food of the tenant consists entirely of ants—*Leptomyrmex erythrocephalus*, Fabr. These are dragged into the nest, the vital fluids sucked from their bodies, after which the remains are thrown out, and other victims secured. The single nest, figured on Plate XVIII. (fig. 6a) is eighteen millimeters deep by twelve wide. Within and from near the middle to the bottom it is very closely woven and beautifully lined with fine white silk; the silk composing the outer part of the structure is of a dirty yellowish colour, coarse and openly woven. This specimen, together with the architect, was obtained by Mr. Froggatt at Aelalong in 1891. At the time I was busy with this portion of my paper, Mr. George Masters, Curator of the Macleay Museum, Sydney, most opportunely drew my attention to a cluster of nests upon a small branch (Pl. XVIII., fig. 6), together with the architects, collected by him at Glen Oak, Williams River. The spiders proved to be of the same species as those collected by Mr. Froggatt at Aelalong. Altogether there were nine nests, showing that while some of these spiders, as evidenced by Mr. Froggatt's collection, lead an isolated life, at other times they are to be met with in colonies. The form and texture of the nests in the cluster (Mr. Masters' specimen) is exactly like the one taken by Mr. Froggatt; but it will, of course, be understood that each nest is tenanted only by one spider. Mr. Masters, to whom I am indebted for the privilege of figuring the specimen collected by him, tells me that the nests are covered with these ants, and that it was their great numbers on the trees that attracted his attention. From the observations of these gentlemen it would appear that this species is decidedly local, but very common where it occurs. So far I have not seen the cocoon made by this interesting Arachnid.

The Australian species of the genus *Misumena*, Latr., exhibit no departure from the typical nidification of the *Thomisidæ*.



According to L. Koch, of *M. pustulosa*, L. Koch, "the egg-sac is white, longish, rounded at both ends, and encloses large numbers of yellow eggs; the sac is contained in a half-rolled leaf, covered with a thick white web projecting over its end."\*

The nest—or pseudo-nest, to quote Wagner—of *Cymbacha festiva*, L. Koch, like those of some other species of the same genus, is an exceedingly interesting piece of work. It consists of an eucalyptus leaf folded over so as to represent a somewhat pyramidiform structure, as illustrated on Pl. XVIII. fig. 7.

Within this structure the spider makes its cocoon. This is somewhat spherical in shape, and consists of two parts, the inferior or basal, and the superior. The latter is the larger of the two, and somewhat thinner in texture; both are united at their greatest diameter. Having completed the cocoon, the female quits her wandering habits, seals down the entrance to the nest, and devotes herself entirely to the care and protection of her eggs, never once leaving the nest for nourishment; and even after the young ones have hatched out, she still maintains her vigilance; but she does not provide them with nourishment, nor does she make any preparation for them in the shape of a nest. After hatching out, the spiderlings remain in the nest until they have undergone their first moult, but when this has been completed they sally forth each to start an independent life.†

In reviewing the spinning work of the Thomisidæ, we find that the members of this group do not spin a web for the capture of prey, but rely solely upon cunning and dexterity; in many instances, as in the *Stephanopisinæ*, their colouration and rugged appearance, closely resembling bark, are of immense value to them, both as a means of procuring food, and as a protection

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\* Die Arachniden Australiens, Vol. ii. p. 801.

† In an interesting paper on "The Origin and Relations of the Tube-weaving Habit," in Proc. Acad. Nat. Sci. Philadelphia, 1888. p. 215, Dr. McCook says:—"The Laterigrades I have found sheltered underneath a little tubular tent, guarding their cocoons, although the tube-making habit seems to be least decided among these of all the Araneid families.

against predatory foes; their nests, or pseudo-nests, in which the cocoon is placed, generally consist of a leaf folded over, as in the case of *Cymbacha festiva*, or, as with *Misumena pustulosa*, with the edges only partially warped over, and held in position by silken threads; in some instances the cocoon is attached to the branches of shrubs and trees, and surrounded by a series of irregular threads; the cocoons are always white, and formed of two plaques, the superior and inferior, but no foreign objects are ever interwoven with the envelope; the texture of the envelope or cocoon enclosing the eggs is closely woven, is exceedingly tough and strong, and not easily torn; when the time for moulting arrives, the spider casts its skin wherever it may happen to be; with the exception referred to above, they do not construct a retreat-nest, either for protection against foes or inclement weather, or for undergoing the process of moulting; and, finally, they generally disperse when young by means of aëronautic flight.

*Conclusion.*—In the course of my remarks in this paper, I have treated only upon the habits and spinning work of such spiders as have come under my own notice and observation. From what I have written it will be seen that the spinning-habits of some are subject to what Wagner terms the “fluctuations of instinct,” as is evidenced by some species of *Attide*. Then, again, there are what are termed “deviations of instinct,” and this is demonstrated by the *Epeiride*, some members of which do not construct an orbicular snare; take for example our *Celenia excavata* and *C. (Thlaosoma) dubia* and the New Zealand species of *Arachnura*; the *Thomiside* also furnish an exceedingly interesting deviation, as is instanced in the case of the species of *Misumenine* collected by Messrs. Froggatt and Masters in the New England district. In addition to this it may not be out of place here to mention that the genera *Celenia* and *Thlaosoma* (the latter doubtless a synonym of the former) are by some naturalists, as Koch and Simon, placed among the *Epeiride*, while by others they are regarded as belonging to the *Thomiside*. At first sight, and taking into account their spinning-habit, it would appear that the latter family would be the correct location. This was the view taken by the Rev. O.

P. Cambridge, F.Z.S., when he founded the genus *Thlaosoma*, for he wrote\*:—"From the disposition of its eyes it bears great resemblance to the Epeirides; but the laterally extended legs and their relative length, link it more decidedly to the Thomisides, of which family, however, its maxillæ and labium, and other generic characters separate it from all the hitherto characterised genera." Until recently I was myself inclined to regard *C. excavata* and *C. dubia* as members of the family *Thomisidæ*; but upon closer study, and after perusing Simon's diagnosis in his magnificent work, "Histoire Naturelle des Araignées," I am forced to the conclusion that they are undoubtedly members of the *Epeiridæ*, or, taking Simon's system of classification, *Argiopide*.

The facts stated in this paper show, as has been proved by Wagner, that too much confidence must not be placed upon the architecture of these creatures as exhibited by them in confinement. Independently of this, however, one great truth has been demonstrated, namely, that any attempt to set up a system of classification upon the basis of a spinning-habit, is at the best chimerical, artificial, and—unscientific.

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#### EXPLANATION OF PLATES.

(PLATE XVII.)

- Fig. 1. — *Epeira pallida*.  
 Fig. 2. — *Epeira crassipes*.  
 Fig. 2a.— „ „ epigyne.  
 Fig. 3. — *Epeira variabilis*.  
 Fig. 3a.— „ „ epigyne.  
 Fig. 3b.— „ „ underside of abdomen.  
 Fig. 4. — *Epeira sylvicola*.  
 Fig. 4a.— „ „ epigyne.  
 Fig. 5. — *Argiope extensa*.  
 Fig. 5a.— „ „ abdomen in profile.  
 Fig. 5b.— „ „ epigyne.  
 Fig. 5c.— „ „ cocoon.
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\* Journ. Linn. Soc. Vol. x. Zoology, p. 274.

Fig. 6. — *Argiope pallida*.

Fig. 6a.— „ „ eyes.

Fig. 6b.— „ „ epigyne.

Fig. 7. — *Argiope gracilis*.

Fig. 8. — *Dicrostichus magnificus*.

Fig. 8a.— „ „ cephalothorax in profile.

Fig. 8b.— „ „ cephalothorax from the front, showing  
arrangement of the eyes.

(PLATE XVIII.)

Fig. 1. — *Cheiracanthium silaceum*.

Fig. 1a.— „ „ epigyne.

Fig. 2. — *Attus flavicruris*.

Fig. 3. } Nests of young of *Epeira wagneri*, Rainb.  
Fig. 3a. }

Fig. 4. — Nest of *Drassus* sp.

Fig. 5. — Nest of *Attus* sp.

Fig. 6. — Group of nests of *Misumeninae* (? gen. et sp.).

Fig. 6a.— Solitary nest of „

Fig. 7. — Nest of *Cymbacha festiva*, Koch.